tion. A tree reflects in its annual rings any reduction in growth activity caused by a large number of factors of which the annual supply of moisture is but one. Anything, from insect attacks, fire injuries, crowding of individual trees, sun scorch, to a variety of fungous and parasitic plant pests, may leave their record in decreased width of annual rings. The great problem is to eliminate all factors but one in each study. It is also a well-known fact that the width of the same annual rings varies considerably in different parts of the trunk. This makes it necessary to depend upon borings in various parts of the trunk from base to top. The frequent occurrence of false rings, double rings, and the absence of certain rings all contribute to the difficulty experienced in reading accurately the past history of the tree from the face of the stump.

I point out these facts to emphasize the large number of variables involved and the need of accumulating a great number of data on such growth correlation studies before conclusions may be hazarded.

An interesting piece of work of this nature has been done in our Idaho forests by Marshall (**9**), who found by measuring the ring growth of western white pine trees that the climate of northern Idaho has exhibited distinct wet and dry periods, varying in length from 20 to 40 or more years. The wet periods he found to be from 1706–1745, 1785–1825, and from 1846–1885. The dry periods were sandwiched in between the wet periods and were from 1746–1785, 1826–1845, and from 1886–1925.

These brief accounts represent but a few of the most important tree diseases which may be placed at the door of the weather man. There are a number of minor disturbances of the functions and damages to parts of trees which have not been touched upon. Enough has been presented to indicate the important rôle that meteorological conditions play in causing economic losses in our timber stands. Windthrow, winter injury, and drought injury are alone responsible for a very formidable loss over a period of years.

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THE RAINFALL OF SALVADOR [1]

By ADELBERT K. BOTTS

[Clark University, Worcester, Mass., December, 1930]

The rainfall of Salvador is an excellent example of west coast trade wind precipitation on the northern margin of the equatorial rainfall belt. The average annual rainfall of the country is 75 inches, an amount which is usually considered very bountiful. However, the distribution, both seasonal and areal, tends to restrict the benefits to certain rather definite periods and places.

Salvador is located on the western side of the Central American Cordilleras between the latitudes 13° and 14° 30′ N. The central part of the country is occupied by a belt of volcanoes, the highest one less than 8,000 feet high, and most of the peaks less than 5,000 feet high. The ridge is high enough, however, to affect the distribution of the rainfall. (Fig. 1.) The rainfall is considerably heavier on the side exposed to the ocean than it is in regions farther from and protected from the ocean. It is generally true that the amount of rainfall varies directly with the altitude of the land. (Fig. 2.)

A comparison of the average annual rainfall conditions of four representative stations shows further consistent modification with elevation. (Fig. 3.) Cutuco has two periods of maximum rainfall, one occurring in June and the other in September. They are separated by a period of distinctly diminished rainfall in July. For each of the remaining three stations the sharp distinction between wet and dry periods during the summer months is progressively modified with increasing altitude. San Salvador, 2,076 feet above the sea, has one continuous wet season lasting from April to November. It seems reasonable to assume that elevation is the controlling factor in this situation, since a study of data for other stations verifies the assumption and since the differences in latitude between the various stations is so slight as to be negligible.

Another modification resulting from increased elevation is decreased variability in amount of rainfall received from year to year. This fact is made evident by a comparison of the differences in the absolute extremes of rainfall by months for the various stations. On the Cutuco chart the vertical lines between extremes are very long. The length of corresponding lines for stations at higher elevations is generally shorter. A short line for any month indicates a slight variability in the rainfall for that month, which amounts in fact to greater uniformity from year to year. San Salvador, the station at the highest elevation, has, generally, the least monthly variability in rainfall from year to year. That seems to indicate that rainfall over a period of years is somewhat more uniform at high than at low elevations.

Rather important in the seasonal distribution of rainfall is the fact that a low total for a year does not imply a consistently dry year, nor a high total a consistently wet year. For Cutuco, the year with the least total rainfall (dotted line) shows rainfall much above the average for the first part of the rainy period, with June for that year the wettest June on record. In that case the second part of the rainy period was the one which cut down the total while the first half of the summer was wetter than usual.

[1] This study was presented to the Association of American Geographers, in their twenty-seventh annual meeting held at Clark University, Worcester, Mass., Dec. 29 to 31, 1930. Acknowledgment for the data upon which this study is based must be made to Mr. Fred Lavis, president of International Railways of Central America, who sent the material to Clark University. Use was made also of Mr. W. W. Reed's article, *Climatological Data for Central America*, in the MONTHLY WEATHER REVIEW, vol. 51, p. 133.

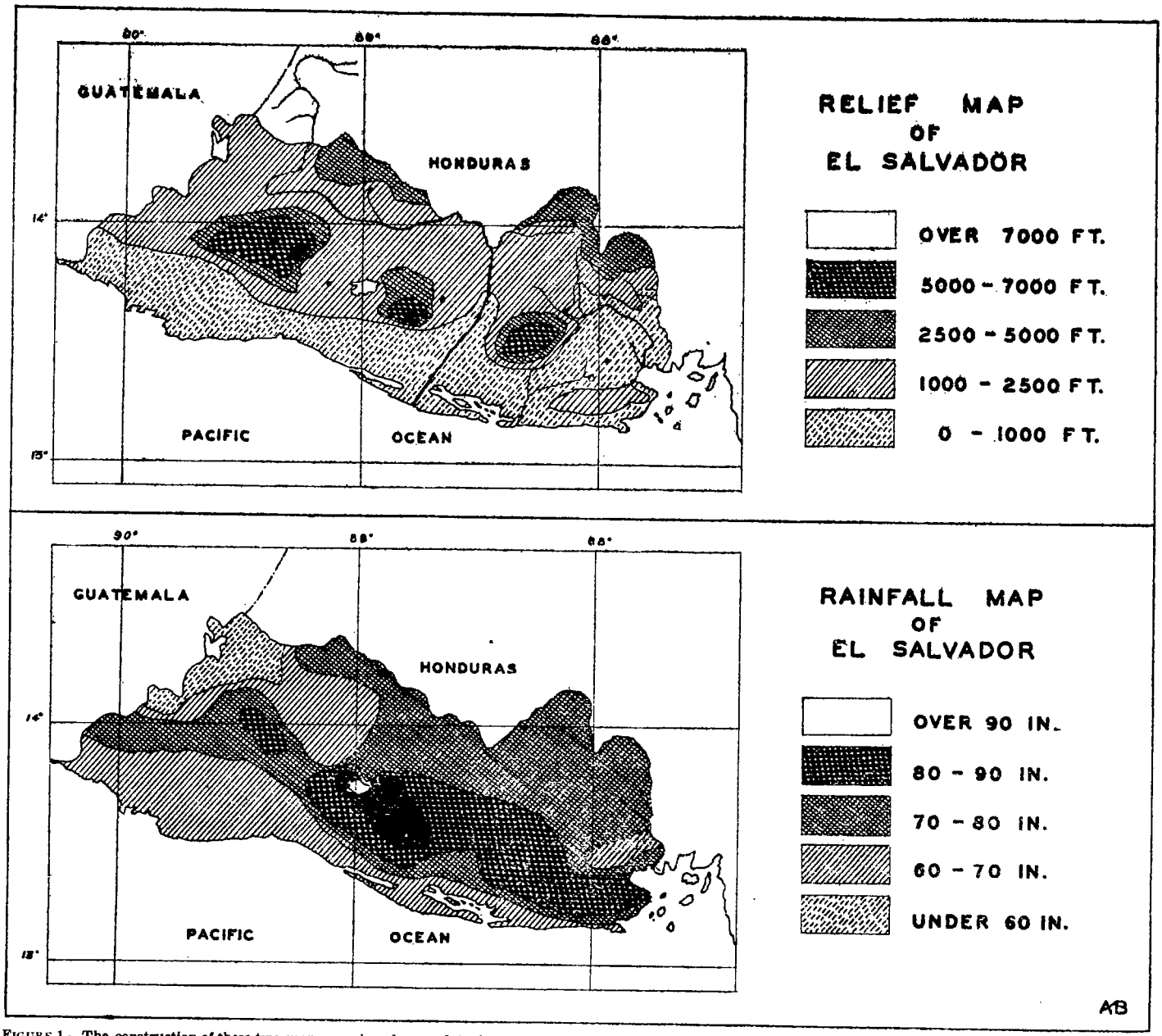

FIGURE 1.—The construction of these two maps was based upon data from 24 stations well distributed throughout the central, southern, and western parts of the country. The northeastern portion of both maps is based upon descriptions and upon older maps. Rainfall data are lacking for elevations higher than 3,000 feet

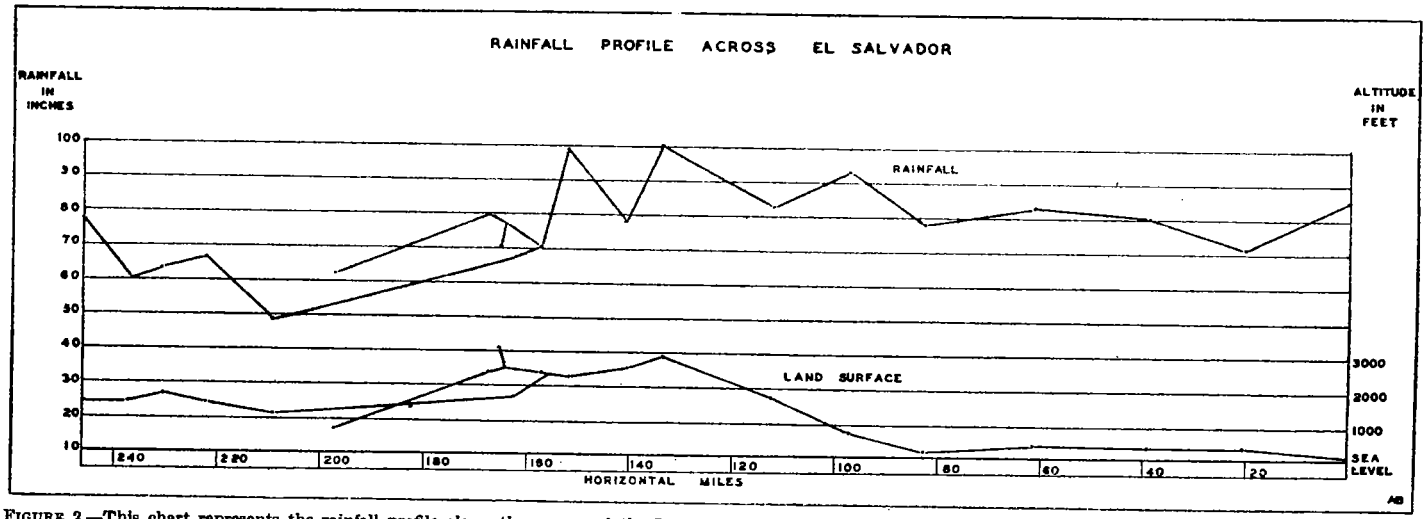

FIGURE 2.—This chart represents the rainfall profile along the course of the International Railway of Central America as it crosses Salvador. The lower line indicates the elevation of the land over which the railway travels. The dots at points where the lines are broken represent the positions of the various stations along the line for which data were available. The positions of the dots in the upper line indicate the amount of rainfall (average annual) for each station

In Olomega the season of least rainfall had the greatest October rainfall on record. Most of the other months that year were below average. In San Salvador the year with the least total registered the greatest May rainfall while the year with the greatest total had the driest October in seven years.

Such conditions are significant in the modifying effect they have upon rainfall distribution in years with extreme totals. A wet year may have drought conditions during months which are ordinarily wet, and, on the other hand, a dry year may have a month or two of unusual floods. Such conditions tend, for any station, to make the annual variability less in proportion than the variability for any month from year to year.

There appears to be rather a distinct relationship between the inclination of the sun's rays and the seasonal distribution of rainfall. Allowing about a month for lag, the dry season follows the period when the noon sun is lowest in the sky. (Fig. 4). The first great spring increase follows the spring season of zenithal sun, and the summer maximum follows the summer period of zenithal sun. At some stations a short summer minimum follows the period when the sun is farthest to the north.

The wind roses (fig. 4) show, somewhat, the relationship between the winds of the ocean and the rainfall of the country. During the dry season all of the winds both near the shore and far out on the ocean are predominantly from a northeasterly direction. Most of them maintain velocities of 4 or 5 on the Beaufort scale. Since Salvador is on a southwest facing coast, these winter northeasterlies blow from the land toward the sea. During the wet season the two circles do not conform. The fall period of maximum rainfall seems to be emphasized by a general influx of upper air from over the ocean as indicated by the outermost circle of wind

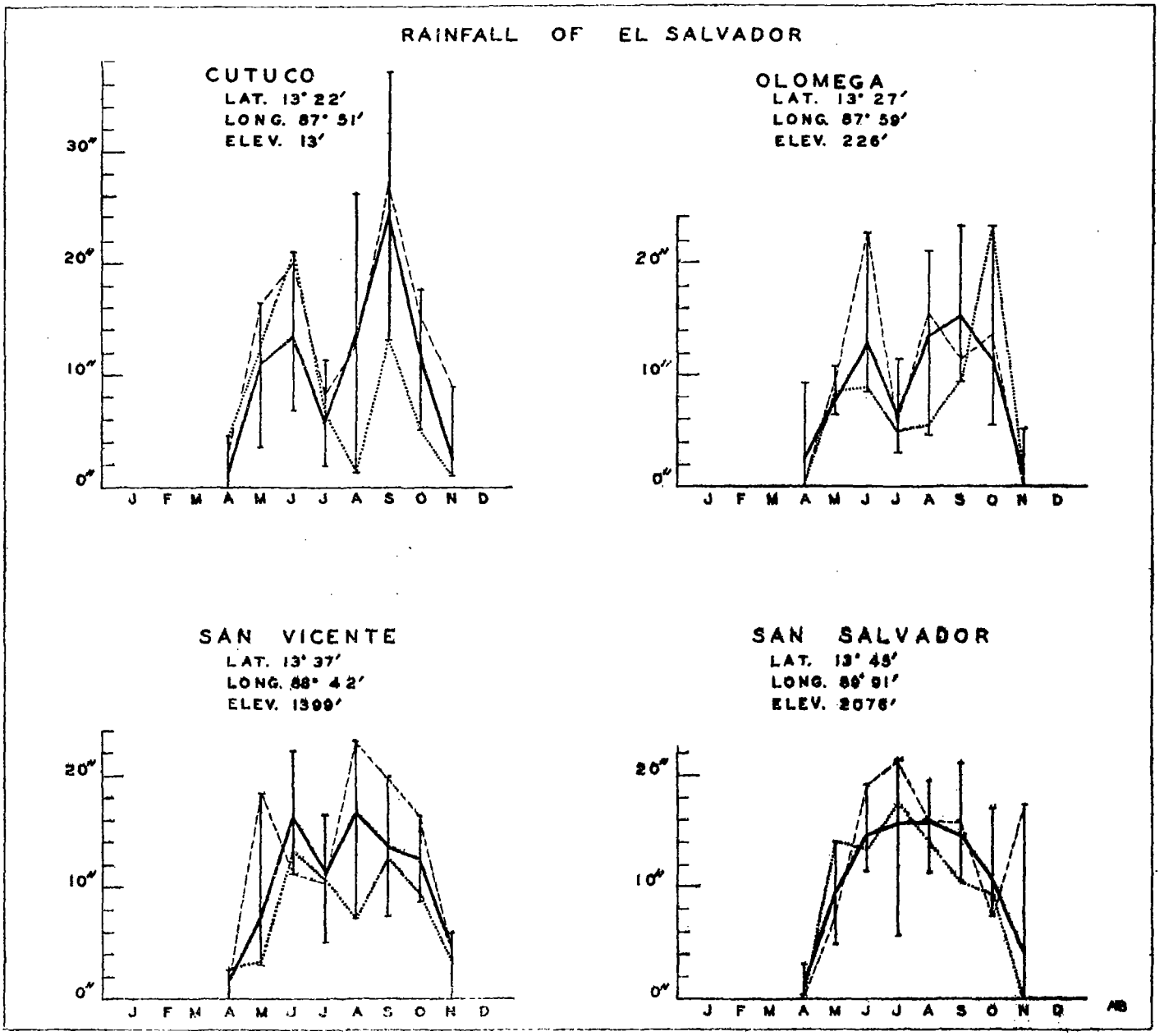

FIGURE 3.—The heavy black lines in these diagrams represent the average annual rainfall for the stations indicated. The dashlines represent the monthly rainfall for the years with the greatest annual total, while the dot-lines indicate the monthly rainfall for the years with the least annual total. The heavy vertical lines connect points representing the greatest absolute extremes of rainfall for each month during the 7-year period on record for each of these stations. The locations of these stations is indicated by dots on the relief map. Cutuco is farthest east, indicated by the dot on the bay. Olomega is next farther west followed in order by San Vicente and San Salvador

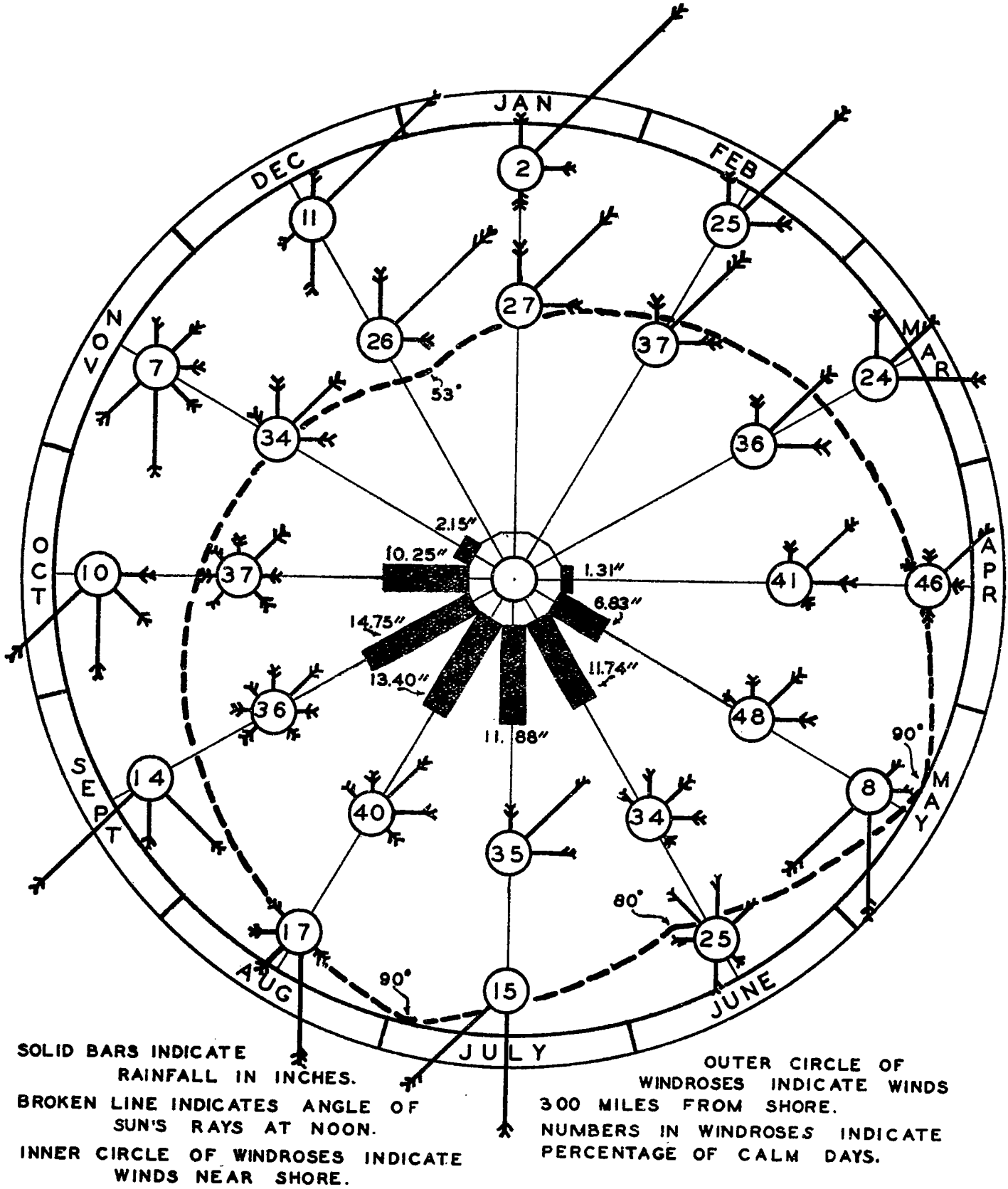

FIGURE 4.—The rainfall indicated in this chart is the average rainfall for all stations of the country. The line indicating the angular position of the sun is made as for the 13° 30′ parallel, and represents the attitude of the sun toward a point on that parallel at noon each day. The nearer the line approaches the circle the more nearly zenithal is the sun. The wind roses represent conditions only on the ocean. Those in the outer circle represent conditions about 300 miles out at sea, while those in the inner circle represent conditions about as near to shore as ships commonly travel. They are all based upon data taken from the United States Hydrographic Office Pilot Charts for the North Pacific Ocean for 1930

roses. The winds out on the ocean have turned about face and blow from the southwest and neighboring directions for several months with forces of 4 and 5, and with a comparatively low per cent of calm days. These winds do not continue as surface winds up to the shore. There the winds are variable with high per cents of calm, and with very infrequent south or southwesterly winds. It is evident that frequently strong southwest winds are blowing 300 miles out at sea while the shore region is in calm. At the same time the northeast winds may be found blowing across the Central American Cordilleras. These latter winds descending on the western side of the mountains tend to increase the speed of convection. Thus the moisture-laden air, brought near to the land by the strong winds starting far out on the ocean, rises and gives to the country of Salvador its bountiful rainfall in the form of heavy convectional summer rains.

TABLE 1.—*Monthly and average precipitation* [1] *(inches)*

Stations	North latitude	West longitude	Elevation	Length of records	January	February	March	April	May	June	July	August	September	October	November	December	Annual
	° ′	° ′	*Feet*	*years*													
Acajutla	13 40	89 55		10	0.03	0.02	0.13	3.22	8.87	12.58	9.99	9.61	9.15	11.06	1.05	0.46	66.17
Ahuachapan	13 54	89 51	2,470	3	(2)	(2)	(2)	1.1	6.33	14.73	10.9	13.2	17.55	8.05	3.2	(2)	75.06
Apopa	13 49	89 44	1,348	4	(2)	(2)	(2)	.33	7.86	11.26	12.96	13.63	10.6	8.1	2.1	(2)	66.84
Atiquizaya	13 58	89 47	2,051	1½	(2)	(2)	(2)	.1	5.85	9.95	10.15	6.9	16.4	8.7	1.9	(2)	59.95
Chalchuapa	13 58	89 42	2,305	3	(2)	(2)	(2)	.06	3.03	12.9	12.63	11.25	11.15	9.2	2.2	(2)	62.42
Coatepeque	13 55	89 30		11	.09	.00	.29	2.36	9.12	11.86	10.63	12.32	11.92	8.63	1.25	.10	68.57
Cojutepeque	13 44	88 53	2,627	7	(2)	(2)	(2)	.86	11.15	17.99	19.77	19.06	17.30	11.23	1.38	(2)	98.74
Cutuco	13 22	87 51	13	7	(2)	(2)	(2)	1.54	11.10	13.55	5.69	13.68	24.06	11.26	2.21	(2)	83.69
Horminguero				7	.00	.02	.73	.62	8.59	14.97	8.49	7.34	15.75	16.70	2.73	.00	75.94
Michapa	13 45	88 53	2,290	1	(2)	(2)	(2)	2.00	0.0	0.0	28.2	16.0	20.2	7.2	2.3	(2)	75.90
Olomega	13 27	87 59	226	7	(2)	(2)	(2)	2.02	7.90	12.81	6.15	13.65	15.21	11.03	1.18	(2)	69.95
San Marcos L	13 26	88 41	65	7	(2)	(2)	(2)	1.38	8.81	12.18	14.15	11.71	14.53	11.82	1.51	(2)	76.09
San Miguel	13 33	88 8	355	7	(2)	(2)	(2)	2.64	9.82	15.27	8.31	12.68	14.23	13.73	2.08	(2)	78.76
San Salvador	13 45	89 91	2,076	7	(2)	(2)	(2)	1.23	9.39	14.63	15.52	15.52	14.24	10.67	4.06	(2)	85.26
San Vicente	13 37	88 42	1,399	7	(2)	(2)	(2)	1.09	7.88	16.27	11.45	16.62	13.83	12.43	2.41	(2)	81.98
Santa Ana (Santa Lucia)	14 5	89 34	2,102	16	.12	.03	.10	1.44	7.47	11.97	10.18	11.09	12.36	8.26	.85	.18	65.93
Soyapango	13 45	89 8	2,040	5	(2)	(2)	(2)	.6	7.52	19.37	14.60	12.40	24.40	16.39	3.0	(2)	98.28
Texiz Junction	14 13	89 33	1,317	3	(2)	(2)	(2)	2.2	1.66	12.36	6.96	10.5	10.95	1.5	2.2	(2)	48.33
Usulutan	13 21	88 25	235	7	(2)	(2)	(2)	2.53	8.14	13.27	9.81	14.74	16.86	12.39	2.62	(2)	80.36
Zacatecoluca	13 27	88 49	564	7	(2)	(2)	(2)	1.28	7.92	16.05	12.77	18.82	18.87	13.81	1.07	(2)	90.59

[1] Complete tables of data for all of the above-named stations has been filed in the library of the United States Weather Bureau

[2] No data.

TABLE 2.—*Monthly and annual precipitation (inches)*

ACAJUTLA [1]

	January	February	March	April	May	June	July	August	September	October	November	December	Annual
1914	0.0	0.0	0.0	0.26	2.26	9.25	5.18	3.28	5.53	3.19	1.69	0.0	60.62
	0.0	0.0	0.0	1.41	2.66	6.75	2.82	3.26	5.85	7.07	0.16	0.0	
1915	0.0	0.0	0.0	0.10	3.20	5.25	10.55	0.50	6.50	3.3	2.40	0.0	71.80
	0.0	0.0	0.0	1.20	12.58	5.65	3.87	6.70	5.50	4.00	0.50	0.0	
1916	0.0	0.0	0.10	0.37	7.07	6.20	10.20	4.40	2.00	0.0	0.0	0.0	59.20
	0.0	0.0	0.0	0.45	0.62	7.27	9.20	6.23	5.09	0.0	0.0	0.0	
1917	0.0	0.0	0.0	0.25	2.97	7.41	8.49	8.23	3.99	5.99	0.0	0.0	59.18
	0.0	0.0	0.0	0.0	3.87	5.22	3.42	4.15	2.36	2.83	0.0	0.0	
1918	0.0	0.10	0.0	0.0	3.28	5.42	4.63	5.41	4.62	3.58	0.0	0.0	70.50
	0.20	0.0	0.67	9.21	5.73	2.21	3.77	3.16	1.99	11.18	1.34	4.00	
1919	0.0	0.0	0.0	0.77	4.02	4.18	10.74	2.75	7.34	1.15	0.47	0.05	64.21
	0.0	0.0	0.15	0.0	2.91	6.25	2.97	5.52	7.37	7.37	0.20	0.0	
1920	0.06	0.0	0.0	0.07	4.13	0.80	3.07	8.65	4.41	4.37	0.0	0.36	51.56
	0.0	0.0	0.0	0.0	5.10	8.14	4.53	2.62	1.95	3.30	0.0	0.0	
1921	0.0	0.04	0.26	5.55	3.75	9.32	0.77	8.65	2.88	5.18	0.20	0.0	85.09
	0.0	0.0	0.0	2.70	6.57	6.97	3.05	2.62	7.39	18.96	0.23	0.0	
1922	0.0	0.0	0.0	7.25	5.70	9.80	1.19	6.81	7.69	4.19	0.10	0.05	74.17
	0.0	0.0	0.15	2.52	1.95	1.88	2.35	9.72	1.85	7.74	3.15	0.08	
1923	0.0	0.02	0.0	0.06	4.18	3.18	4.77	2.22	3.40	12.05	0.05	0.02	65.29
	0.0	0.0	0.0	0.07	6.14	14.67	4.30	1.25	3.80	5.11	0.0	0.0	
Mean	0.03	0.02	0.13	3.22	8.87	12.58	9.99	9.61	9.15	11.06	1.05	0.46	66.17
Maximum	0.21	0.10	0.67	9.21	15.78	17.85	19.40	16.53	14.71	24.14	3.25	4.00	85.09
Minimum	0.0	0.0	0.0	0.07	4.92	7.63	3.54	3.54	6.20	0.0	0.0	0.0	51.56

AHUACHAPAN

1928	(2)	(2)	(2)	1.8	3.5	16.6	10.1	14.5	10.2	6.1	3.0	(2)	65.8
1929	(2)	(2)	(2)	0.4	9.3	11.9	12.2	11.9	24.9	10.0	3.4	(2)	84.0
1930	(2)	(2)	(2)	1.1	6.2	15.7	10.4	(2)	(2)	(2)	(2)	(2)	(2)
Mean	(2)	(2)	(2)	1.1	6.33	14.73	10.9	13.2	17.55	8.05	3.2	(2)	75.06
Maximum	(2)	(2)	(2)	1.8	9.3	16.6	12.2	14.5	24.9	10.0	3.4	(2)	84.0
Minimum	(2)	(2)	(2)	0.4	3.5	11.9	10.1	11.9	10.2	6.1	3.0	(2)	65.8

APOPA

1927	(2)	(2)	(2)	(2)	(2)	(2)	(2)	10.1	2.6	3.9	0.0	(2)	(2)
1928	(2)	(2)	(2)	0.0	7.2	15.1	14.3	14.6	13.1	8.5	4.9	(2)	77.7
1929	(2)	(2)	(2)	0.0	11.5	7.4	14.5	16.2	16.1	11.9	1.4	(2)	79.0
1930	(2)	(2)	(2)	1.0	4.9	11.3	10.1	(2)	(2)	(2)	(2)	(2)	(2)
Mean	(2)	(2)	(2)	0.33	7.86	11.26	12.96	13.63	10.6	8.1	2.1	(2)	66.84
Maximum	(2)	(2)	(2)	1.0	11.5	15.1	14.5	16.2	16.1	11.9	4.9	(2)	79.0
Minimum	(2)	(2)	(2)	0.0	4.9	7.4	10.1	10.1	2.6	3.9	1.4	(2)	77.7

[1] Data given by half month periods.

[2] No data.

TABLE 2.—*Monthly and annual precipitation (inches)*—Continued

ATIQUIZAYA

	January	February	March	April	May	June	July	August	September	October	November	December	Annual
1929	(1)	(1)	(1)	0.2	7.4	7.6	11.6	6.9	16.4	8.7	1.9	(1)	60.7
1930	(1)	(1)	(1)	0.0	4.3	12.3	8.7	(1)	(1)	(1)	(1)	(1)	(1)
Mean	(1)	(1)	(1)	0.1	5.85	9.95	10.1	(1)	(1)	(1)	(1)	(1)	(1)
Maximum	(1)	(1)	(1)	0.2	7.4	12.3	11.6	(1)	(1)	(1)	(1)	(1)	(1)
Minimum	(1)	(1)	(1)	0.0	4.3	7.6	8.7	(1)	(1)	(1)	(1)	(1)	(1)

CHALCHAUAPA

1928	(1)	(1)	(1)	0.0	0.0	4.9	21.6	14.1	8.5	9.0	2.9	(1)	61.0
1929	(1)	(1)	(1)	0.2	2.0	17.3	9.2	8.4	13.8	9.4	1.5	(1)	61.8
1930	(1)	(1)	(1)	0.0	7.1	16.7	7.1	(1)	(1)	(1)	(1)	(1)	(1)
Mean	(1)	(1)	(1)	0.06	3.03	12.9	12.63	11.25	11.15	9.2	2.2	(1)	62.42
Maximum	(1)	(1)	(1)	0.2	7.1	17.3	21.6	14.1	13.8	9.4	2.9	(1)	61.8
Minimum	(1)	(1)	(1)	0.0	0.0	4.9	7.1	8.4	8.5	9.0	1.5	(1)	61.0

COATEPEQUE [1]

1913	(1)	(1)	(1)	(1)	(1)	4.34	4.88	8.68	4.25	1.61	0.0	0.0	(1)
	(1)	(1)	(1)	(1)	(1)	9.80	6.61	6.86	5.97	7.34	0.0	0.0	(1)
1914	0.0	0.0	0.0	3.31	4.74	7.15	8.72	3.10	6.05	8.02	4.04	0.0	84.4
	0.0	0.0	0.0	0.72	8.79	7.78	5.93	4.80	6.53	4.70	0.02	0.0	
1915	0.0	0.0	0.0	0.44	3.01	5.69	8.94	6.34	6.93	3.31	1.29	0.31	75.37
	0.0	0.0	0.32	0.95	11.22	6.59	3.67	9.17	5.84	0.83	0.0	0.52	
1916	0.12	0.0	0.0	0.31	6.04	2.95	2.54	4.04	2.92	5.43	0.06	0.03	62.81
	0.83	0.0	0.0	1.54	3.11	7.26	5.71	9.83	9.31	0.47	0.31	0.0	
1917	0.0	0.0	0.0	1.03	1.85	2.60	5.57	10.08	5.20	6.32	0.32	0.0	69.75
	0.0	0.0	1.0	0.0	2.40	6.61	8.35	6.88	5.41	6.13	0.0	0.0	
1918	0.0	0.0	0.0	0.0	5.24	8.50	5.16	5.57	4.65	2.24	0.0	0.0	70.75
	0.0	0.0	0.0	7.99	6.49	6.54	3.00	3.90	6.95	4.52	0.0	0.0	
1919	0.0	0.0	0.0	0.02	5.09	2.82	10.17	1.72	3.27	3.24	1.55	0.0	53.40
	0.0	0.0	0.0	0.25	1.51	5.30	4.69	4.57	6.54	2.66	0.0	0.0	
1920	0.0	0.0	0.0	0.0	5.63	2.35	7.56	12.57	10.20	1.57	3.59	0.10	74.54
	0.0	0.0	0.0	0.58	7.22	8.50	6.33	3.97	2.08	2.29	0.0	0.0	
1921	0.0	0.0	1.15	3.71	2.07	5.21	4.14	5.68	4.77	5.27	0.0	0.0	82.69
	0.0	0.0	0.46	0.0	6.14	9.92	4.82	3.93	10.22	14.50	0.70	0.0	
1922	0.0	0.0	0.0	0.95	2.55	11.93	3.87	2.80	5.67	4.04	0.16	0.0	60.28
	0.0	0.0	0.0	1.85	2.38	3.54	3.19	8.67	6.39	1.83	0.46	0.0	
1923	0.0	0.0	0.0	0.0	2.69	3.84	3.12	(1)	(1)	(1)	(1)	(1)	
	0.0	0.0	0.26	0.0	3.05	1.27	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Mean	0.09	0.0	0.29	2.36	9.12	11.86	10.63	12.32	11.92	8.63	1.25	0.10	68.57
Maximum	0.95	0.0	1.61	7.99	14.23	15.47	14.86	16.96	14.99	19.77	4.06	0.83	84.40
Minimum	0.0	0.0	0.0	0.0	4.25	5.11	7.06	6.29	9.81	3.86	0.0	0.0	53.40

COJUTEPEQUE

1924	(1)	(1)	(1)	(1)	8.90	15.50	12.00	17.50	14.20	10.70	0.0	0.0	(1)
1925	(1)	(1)	(1)	2.30	4.20	9.30	15.80	9.30	9.35	10.20	3.70	0.0	64.15
1926	(1)	(1)	(1)	0.0	8.35	11.95	9.80	14.40	14.46	7.81	0.40	0.0	67.17
1927	(1)	(1)	(1)	0.0	13.10	14.30	19.50	11.40	12.70	14.70	0.0	0.0	85.70
1928	(1)	(1)	(1)	1.70	5.90	48.40	44.70	18.40	26.10	6.10	4.20	0.0	155.50
1929	(1)	(1)	(1)	0.0	7.80	16.00	24.00	43.40	27.00	17.90	0.0	0.0	136.10
1930	(1)	(1)	(1)	1.20	29.80	10.50	12.60	(1)	(1)	(1)	(1)	(1)	(1)
Mean	(1)	(1)	(1)	.86	11.15	17.99	19.77	19.06	17.30	11.23	1.38	0.0	98.74
Maximum	(1)	(1)	(1)	2.30	29.80	48.40	44.70	43.40	27.00	17.90	4.20	0.0	155.50
Minimum	(1)	(1)	(1)	0.0	4.20	9.30	9.80	9.30	9.35	6.10	0.0	0.0	64.15

CUTUCO

1924	(1)	(1)	(1)	0.76	2.78	17.17	11.45	13.77	12.25	9.60	0.0	0.0	(1)
1925	(1)	(1)	(1)	4.23	12.35	20.25	6.58	1.89	13.34	5.06	1.0	0.0	64.70
1926	(1)	(1)	(1)	0.0	9.40	11.05	4.50	16.80	37.10	13.60	0.0	0.0	92.45
1927	(1)	(1)	(1)	0.0	12.20	8.00	4.00	11.20	33.10	6.90	0.0	0.0	75.40
1928	(1)	(1)	(1)	3.80	16.80	20.00	8.40	12.70	27.00	15.30	8.8	0.0	112.80
1929	(1)	(1)	(1)	0.0	15.70	6.80	3.00	26.40	21.60	17.10	3.5	0.0	94.10
1930	(1)	(1)	(1)	0.5	12.70	11.60	1.90	(1)	(1)	(1)	(1)	(1)	(1)
Mean	(1)	(1)	(1)	1.54	11.10	13.55	5.69	13.68	24.06	11.26	2.21	0.0	83.69
Maximum	(1)	(1)	(1)	4.23	16.80	20.25	11.45	26.40	37.10	17.10	8.80	0.0	112.80
Minimum	(1)	(1)	(1)	0.0	2.78	6.80	1.90	1.89	12.25	5.06	0.0	0.0	64.70

HORMINGUERO

1917	0.0	0.0	0.0	0.0	3.30	8.58	10.33	13.70	15.57	25.21	0.59	0.0	77.30
1918	0.0	0.0	2.97	3.34	10.31	21.33	7.22	7.40	10.94	15.44	1.50	0.0	80.45
1919	0.0	0.0	0.0	0.70	9.92	8.41	11.80	6.46	16.24	10.13	2.63	0.0	66.27
1920	0.0	0.0	0.0	0.28	7.84	10.81	2.28	7.36	16.78	10.23	11.94	0.0	67.52
1921	0.0	0.15	0.82	0.0	8.14	24.10	9.70	7.47	18.33	21.68	2.23	0.0	92.62
1922	0.0	0.0	0.0	0.0	16.61	17.61	7.67	6.23	15.95	23.76	0.22	0.0	89.44
1923	0.0	0.0	1.35	0.04	3.98	13.98	10.46	2.78	16.44	10.42	0.0	0.0	58.05
Mean	0.0	0.02	0.73	0.62	8.59	14.97	8.49	7.34	15.75	16.70	2.73	0.0	75.94
Maximum	0.0	0.15	2.97	3.34	16.61	24.10	11.80	13.70	18.33	25.21	11.94	0.0	92.62
Minimum	0.0	0.0	0.0	0.0	3.30	8.41	2.28	2.78	10.94	10.13	0.0	0.0	58.05

[1] Data given by half month periods.

[1] No data.

TABLE 2.—*Monthly and annual precipitation (inches)*—Continued

MICHAPA

	January	February	March	April	May	June	July	August	September	October	November	December	Annual
1928	(1)	(1)	(1)	2.00	0.0	0.0	0.0	16.0	20.2	7.2	2.3	0.0	75.90

OLOMEGA

1924	(1)	(1)	(1)	(1)	(1)	14.60	11.70	18.10	16.77	5.90	0.0	(1)	(1)
1925	(1)	(1)	(1)	9.10	7.10	13.90	5.50	4.30	13.60	6.70	4.60	(1)	64.80
1926	(1)	(1)	(1)	0.0	4.90	12.10	5.50	21.30	15.60	10.20	1.00	(1)	70.60
1927	(1)	(1)	(1)	0.0	9.70	22.50	5.90	15.80	11.70	13.90	0.0	(1)	79.50
1928	(1)	(1)	(1)	1.00	10.90	9.80	6.50	16.70	23.80	5.70	0.0	(1)	74.40
1929	(1)	(1)	(1)	0.0	8.20	8.60	5.00	5.70	9.80	23.80	1.50	(1)	62.60
1930	(1)	(1)	(1)	0.0	6.60	8.20	3.00	(1)	(1)	(1)	(1)	(1)	(1)
Mean	(1)	(1)	(1)	2.20	7.90	12.81	6.15	13.65	15.21	11.03	1.18	(1)	69.95
Maximum	(1)	(1)	(1)	9.10	10.90	22.50	11.70	21.30	23.80	23.80	4.60	(1)	79.50
Minimum	(1)	(1)	(1)	0.0	4.90	8.20	3.00	4.30	9.80	5.70	0.0	(1)	62.60

SAN MARCOS L.

1924	(1)	(1)	(1)	(1)	6.30	18.80	21.00	17.71	13.20	4.70	0.0	(1)	(1)
1925	(1)	(1)	(1)	6.20	6.30	11.20	7.95	3.10	15.01	7.86	3.31	(1)	60.93
1926	(1)	(1)	(1)	0.0	9.70	7.40	9.80	12.10	4.60	2.80	0.0	(1)	46.40
1927	(1)	(1)	(1)	0.0	9.90	12.70	15.30	26.0	17.0	25.50	0.0	(1)	106.40
1928	(1)	(1)	(1)	2.10	4.80	21.60	30.80	0.0	20.20	8.60	4.80	(1)	92.90
1929	(1)	(1)	(1)	0.0	11.50	3.80	11.00	11.40	17.20	21.50	1.00	(1)	77.40
1930	(1)	(1)	(1)	0.0	13.20	9.70	3.20	(1)	(1)	(1)	(1)	(1)	(1)
Mean	(1)	(1)	(1)	1.38	8.81	12.18	14.15	11.71	14.53	11.82	1.51	(1)	76.09
Maximum	(1)	(1)	(1)	6.20	13.20	21.60	30.80	26.00	20.20	25.50	4.80	(1)	106.40
Minimum	(1)	(1)	(1)	0.0	4.80	3.80	3.20	0.0	4.60	4.70	0.0	(1)	46.40

SAN MIGUEL

1924	(1)	(1)	(1)	(1)	4.66	13.90	19.60	23.20	13.30	9.80	0.0	(1)	(1)
1925	(1)	(1)	(1)	11.40	4.50	12.10	4.20	3.60	20.70	15.00	3.20	(1)	74.70
1926	(1)	(1)	(1)	0.0	12.88	18.00	5.30	12.80	8.80	11.10	0.80	(1)	69.68
1927	(1)	(1)	(1)	0.0	11.10	20.30	5.20	13.60	13.30	21.00	0.0	(1)	84.50
1928	(1)	(1)	(1)	0.30	15.10	16.10	12.10	11.20	15.90	6.10	6.70	(1)	83.50
1929	(1)	(1)	(1)	0.0	16.70	17.50	9.20	11.70	13.40	19.40	1.80	(1)	89.70
1930	(1)	(1)	(1)	1.50	3.80	9.00	2.60	(1)	(1)	(1)	(1)	(1)	(1)
Mean	(1)	(1)	(1)	2.64	9.82	15.27	8.31	12.68	14.23	13.73	2.08	(1)	78.76
Maximum	(1)	(1)	(1)	11.40	16.70	20.30	19.60	23.20	20.70	21.00	6.70	(1)	89.70
Minimum	(1)	(1)	(1)	0.0	3.80	9.00	2.60	3.60	8.80	6.10	0.0	(1)	69.68

SAN SALVADOR

1924	(1)	(1)	(1)	(1)	4.82	16.35	19.00	18.91	13.05	9.30	0.0	(1)	(1)
1925	(1)	(1)	(1)	3.00	6.70	12.82	17.53	13.40	13.71	13.02	3.20	(1)	83.38
1926	(1)	(1)	(1)	1.90	7.20	18.45	11.90	19.45	11.97	8.10	1.30	(1)	80.27
1927	(1)	(1)	(1)	0.0	14.00	13.10	17.50	14.00	10.30	9.50	0.0	(1)	78.40
1928	(1)	(1)	(1)	0.20	7.30	19.00	21.20	15.70	15.60	7.40	17.50	(1)	103.90
1929	(1)	(1)	(1)	0.0	5.00	11.40	15.60	11.70	20.80	16.70	2.40	(1)	83.60
1930	(1)	(1)	(1)	2.30	6.70	11.30	5.90	(1)	(1)	(1)	(1)	(1)	(1)
Mean	(1)	(1)	(1)	1.23	9.39	14.63	15.52	15.50	14.24	10.67	4.06	(1)	85.25
Maximum	(1)	(1)	(1)	3.00	14.00	19.00	21.20	19.45	20.80	16.70	17.50	(1)	103.90
Minimum	(1)	(1)	(1)	0.0	4.82	11.30	5.90	11.70	10.30	7.40	0.0	(1)	78.40

SAN VICENTE

1924	(1)	(1)	(1)	(1)	3.00	22.05	16.45	17.10	14.75	12.40	0.0	(1)	(1)
1925	(1)	(1)	(1)	2.63	3.47	13.05	10.62	7.13	12.57	9.25	3.85	(1)	62.60
1926	(1)	(1)	(1)	0.0	5.19	10.13	12.69	20.60	10.80	9.00	0.0	(1)	68.41
1927	(1)	(1)	(1)	0.0	11.90	21.20	16.50	13.70	7.30	14.80	0.0	(1)	85.40
1928	(1)	(1)	(1)	1.30	6.30	21.00	5.20	18.30	17.70	13.00	6.00	(1)	88.80
1929	(1)	(1)	(1)	0.30	18.10	11.30	10.20	22.90	19.90	16.10	4.60	(1)	103.40
1930	(1)	(1)	(1)	2.30	7.20	15.2	8.50	(1)	(1)	(1)	(1)	(1)	(1)
Mean	(1)	(1)	(1)	1.09	7.88	16.27	11.45	16.62	13.83	12.43	2.41	(1)	81.98
Maximum	(1)	(1)	(1)	2.66	18.10	22.05	16.50	22.90	19.90	16.10	6.00	(1)	103.40
Minimum	(1)	(1)	(1)	0.0	3.00	10.13	5.20	7.13	7.30	9.00	0.0	(1)	62.60

SANTA ANA [2]

1912	(1)	(1)	(1)	(1)	1.06	1.91	3.90	2.51	6.38	3.50	0.10	0.83	(1)
	(1)	(1)	(1)	0.09	4.28	2.60	4.95	5.33	5.68	2.13	0.0	0.0	
1913	0.0	0.0	0.0	1.03	1.21	5.09	6.13	3.75	5.61	2.44	0.0	0.0	60.80
	0.0	0.0	0.0	0.86	10.65	5.25	6.43	3.14	2.99	6.22	0.0	0.0	
1914	0.0	0.0	0.0	0.12	2.56	5.84	4.05	1.58	10.29	3.99	0.47	0.0	60.87
	0.0	0.0	0.0	1.26	7.59	6.32	1.77	7.23	5.48	2.32	0.0	0.0	
1915	0.0	0.0	0.0	1.08	2.46	8.18	10.62	7.95	7.81	3.53	0.42	0.42	79.49
	0.0	0.0	0.27	0.0	6.89	5.52	10.00	8.02	5.30	0.45	0.46	0.11	
1916	0.0	0.0	0.0	0.17	8.36	1.62	3.50	5.61	2.82	3.74	0.13	0.04	69.70
	0.80	0.0	0.0	7.06	4.73	6.87	7.88	3.97	8.72	2.83	0.85	0.0	
1917	0.0	0.05	0.0	0.28	1.65	5.51	4.95	9.15	4.99	5.14	0.55	0.0	64.23
	0.0	0.26	0.0	0.03	2.34	8.77	4.75	5.21	7.32	3.28	0.0	0.0	
1918	0.0	0.0	0.0	0.0	3.55	7.37	2.63	7.96	3.11	4.37	0.0	0.0	67.06
	0.33	0.0	0.0	3.99	3.83	6.83	4.83	4.52	7.69	6.05	0.0	0.0	
1919	0.04	0.0	0.0	0.14	4.86	5.95	7.96	2.12	2.02	6.54	1.38	0.0	56.97
	0.0	0.0	0.0	0.66	1.12	7.09	3.43	5.73	6.06	1.87	0.0	0.0	
1920	0.0	0.0	0.0	0.0	3.14	3.18	3.88	11.14	12.41	2.77	1.45	0.0	65.9
	0.0	0.0	0.0	0.0	6.34	9.06	4.15	3.97	2.06	2.11	0.0	0.0	

[1] No data.

[2] 1920 to 1923 data given by half month periods.

TABLE 2.—*Monthly and annual precipitation (inches)*—Continued

SANTA ANA—Continued

	January	February	March	April	May	June	July	August	September	October	November	December	Annual
1921	0.0	0.0	0.70	0.0	0.80	9.37	3.05	9.54	6.55	7.09	0.0	0.71	85.83
	0.0	0.0	0.0	0.0	3.12	8.55	3.76	4.11	12.91	14.65	0.92	0.0	
1922	0.0	0.0	0.0	(1)	0.0	13.20	3.96	7.45	8.32	4.39	1.22	0.0	(1)
	0.0	0.0	0.0	(1)	5.57	4.22	4.42	13.08	7.65	1.27	1.51	0.0	(1)
1923	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	1.70	7.52	0.0	0.0	(1)
	(1)	(1)	(1)	(1)	(1)	(1)	(1)	0.57	3.85	0.75	0.0	0.0	(1)
1927	(1)	(1)	(1)	(1)	15.50	13.50	16.20	9.40	14.40	6.30	0.0	(1)	75.3
1928	(1)	(1)	(1)	0.70	11.30	15.50	11.40	14.00	10.40	6.20	3.30	(1)	73.90
1929	(1)	(1)	(1)	1.70	8.20	10.00	12.60	9.30	15.00	12.20	0.0	(1)	69.00
1930	(1)	(1)	(1)	4.00	8.40	13.20	11.80	(1)	(1)	(1)	(1)	(1)	(1)
Mean	0.12	0.03	0.10	1.44	7.47	11.97	10.18	11.09	12.36	8.26	0.85	0.18	65.93
Maximum	0.80	0.26	0.70	7.23	15.50	17.92	20.62	20.53	19.46	21.74	3.30	0.83	85.83
Minimum	0.0	0.0	0.0	0.0	3.92	4.51	5.82	6.89	5.55	3.98	0.0	0.0	60.80

SOYAPANGO

1926	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	17.50	8.90	0.70	(1)	(1)
1927	(1)	(1)	(1)	0.0	0.0	23.20	20.00	24.30	21.90	27.50	0.0	(1)	116.90
1928	(1)	(1)	(1)	0.50	8.50	25.10	19.70	0.0	38.60	16.80	6.30	(1)	115.50
1929	(1)	(1)	(1)	0.0	7.00	13.90	12.60	12.90	19.60	13.10	5.10	(1)	84.20
1930	(1)	(1)	(1)	1.30	7.10	11.30	6.10	(1)	(1)	(1)	(1)	(1)	(1)
Mean	(1)	(1)	(1)	0.60	7.52	19.37	14.60	12.40	24.40	16.39	3.00	(1)	95.28
Maximum	(1)	(1)	(1)	1.30	8.50	25.10	20.00	24.30	38.60	27.50	6.30	(1)	116.90
Minimum	(1)	(1)	(1)	0.0	0.0	11.30	6.10	0.0	17.50	8.90	0.0	(1)	84.20

TEXIZ JUNCTION

1928	(1)	(1)	(1)	3.40	0.0	18.0	9.30	17.50	7.40	0.0	4.40	(1)	60.00
1929	(1)	(1)	(1)	3.20	3.40	11.40	5.30	3.50	14.50	3.00	0.0	(1)	44.30
1930	(1)	(1)	(1)	0.0	1.60	7.70	6.30	(1)	(1)	(1)	(1)	(1)	(1)
Mean	(1)	(1)	(1)	2.20	1.66	12.76	6.96	10.50	10.95	1.50	2.20	(1)	48.33
Maximum	(1)	(1)	(1)	3.40	3.40	18.00	9.30	17.50	14.50	3.00	4.40	(1)	60.00
Minimum	(1)	(1)	(1)	0.0	0.0	7.70	5.30	3.50	7.40	0.0	0.0	(1)	44.30

USULUTAN

1924	(1)	(1)	(1)	(1)	0.83	19.97	17.01	18.56	14.04	8.35	0.0	(1)	(1)
1925	(1)	(1)	(1)	10.98	5.05	8.14	9.26	6.19	21.03	13.15	4.05	(1)	77.85
1926	(1)	(1)	(1)	0.0	3.30	13.70	9.03	22.20	21.70	14.06	0.40	(1)	84.39
1927	(1)	(1)	(1)	0.0	23.50	22.20	12.20	16.90	12.60	12.10	0.0	(1)	99.50
1928	(1)	(1)	(1)	0.60	8.60	15.40	6.30	14.10	17.00	5.40	7.20	(1)	74.60
1929	(1)	(1)	(1)	1.10	9.60	9.30	9.70	10.50	14.80	21.30	2.30	(1)	78.60
1930	(1)	(1)	(1)	0.0	6.10	4.20	5.20	(1)	(1)	(1)	(1)	(1)	(1)
Mean	(1)	(1)	(1)	2.53	8.14	13.27	9.81	14.74	16.86	12.39	2.62	(1)	80.36
Maximum	(1)	(1)	(1)	10.98	23.50	22.20	17.01	22.20	21.70	21.30	7.20	(1)	99.50
Minimum	(1)	(1)	(1)	0.0	0.83	4.20	5.20	6.19	12.60	5.40	0.0	(1)	74.60

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1924	(1)	(1)	(1)	(1)	2.70	19.70	23.20	17.70	20.50	15.98	0.0	(1)	(1)
1925	(1)	(1)	(1)	3.28	8.71	11.68	13.42	9.37	9.79	9.74	2.97	(1)	68.96
1926	(1)	(1)	(1)	0.0	7.09	14.42	15.27	25.86	19.77	17.55	0.0	(1)	99.96
1927	(1)	(1)	(1)	0.0	13.60	12.80	4.80	26.80	13.40	11.90	0.0	(1)	83.30
1928	(1)	(1)	(1)	2.00	10.20	19.30	13.40	17.70	26.20	9.10	3.50	(1)	101.40
1929	(1)	(1)	(1)	0.0	10.00	19.30	11.60	15.50	23.60	18.60	0.0	(1)	98.60
1930	(1)	(1)	(1)	2.40	3.20	15.20	7.70	(1)	(1)	(1)	(1)	(1)	(1)
Mean	(1)	(1)	(1)	1.28	7.92	16.05	12.77	18.82	18.87	13.81	1.07	(1)	90.59
Maximum	(1)	(1)	(1)	3.28	13.60	19.70	23.20	26.80	26.20	18.60	3.50	(1)	101.40
Minimum	(1)	(1)	(1)	0.0	2.70	11.68	4.80	9.37	9.79	9.10	0.0	(1)	68.96

[1] No data.

NOTES, ABSTRACTS, AND REVIEWS

Glaze storm in South Dakota, November 18 to 20, 1930, by M. E. Blystone.—The glaze storm of November 19 to 20, 1930, extended from Charles Mix and Gregory Counties, S. Dak., northward to Edmunds County, and from Edmunds, Faulk, and northern Hand Counties eastward to the border of the State. It occurred during the passage of a cyclone of great intensity from Texas northeastward across the western slope of the Mississippi Basin. Within the area indicated the temperature was near, or slightly below, the freezing point, and the precipitation occurred mostly in the form of rain. The rain froze on electric wires, trees, etc., forming cylinders of ice which, in many instances, are reported to have been an inch or more in diameter. The weight of the ice, together with the rather high wind that attended the storm, caused wires and large numbers of poles to be broken down. Trees, also, were broken down, but the main damage was to electric lines. The damage from this storm is estimated to be from $400,000 to $500,000. It is generally believed that this was the most destructive glaze storm in the history of South Dakota. However, the great increase in the mileage of electric lines in recent years has greatly increased the possibilities of destruction by such a storm.

The width of the zone within which the glaze storm occurred is from 30 to 60 miles. To the north and west of this zone the precipitation was in the form of snow. While to the south and east of the two wings of the glaze